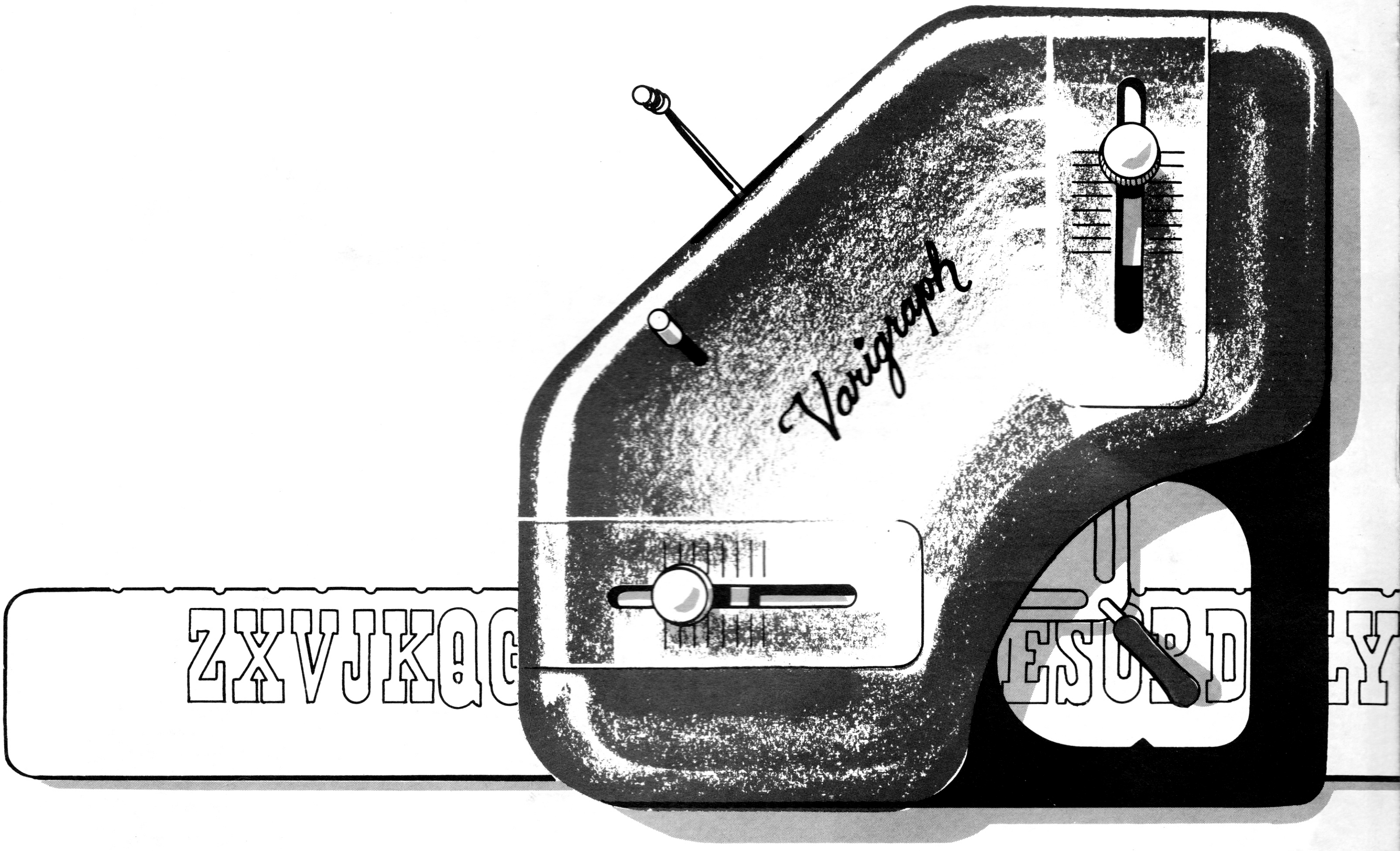
INSTRUCTION MANUAL

for the

Varigraph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VARIGRAPH INC. MADISON 1, WIS.

VARIGRAPH OPERATING MANUAL

TABLE OF CONTENTS

Part		Page
I	FOREWORD	1
II	EQUIPMENT AND SUPPLIES	2
	Lighting	2
	Work Surface	2
	T-Square and Straightedge	3
	Chair	3
	Storing	3
	Papers, Etc	4
	Inks	4
	Miscellaneous Equipment	5
III	LAYING OUT THE WORK	5
IV	THE VARIGRAPH	7
	Servicing	7
	Storing	7
	Cleaning	7
	Testing	8
	Mats	8
	Pens	9
	Curve Attachment	10
	Pen Tank	10
V	VARIGRAPH OPERATION	10
	Basic Operation	10
	Setting Up	11
VI	COMPLETION: FILL-IN AND PASTE-UP	17
	Fill-in Mats	17
	Hand Fill-in	18
VII	PASTING-UP FINISHED LETTERING	19

PART 1 FOREWORD

Style 9U

The Varigraph was developed primarily for the production of display typography for photographic reproduction processes such as offset printing and letterpress. However because of its great versatility the Varigraph is used for many additional applications such as silk screen printing; chart work; cartography; engineering and architectural drawings; color comprehensives; direct image duplicating; projection slides; television and film titling; certificate, diploma and related engrossing work; displays; exhibits; etc. Only photographic reproduction processes are dealt with here. Persons interested in other applications will also find this manual of considerable value. Learning the basic operation of the Varigraph is imperative before any of its many applications can be tried.

This manual presumes that the reader has little background in the preparation of art and copy for photographic reproduction. Therefore, the contents suggest basic materials to be used, and provide instruction in pasting-up art and copy. Discussions on layout, letter spacing, retouching, etc. are also included for the benefit of beginners. Persons experienced in these particular areas may not find it necessary to devote much time to such information--they may turn directly to Parts 4 and 5 which deal with Varigraph equipment and operation--nevertheless, even personnel experienced in layout, letter spacing, retouching, etc., can profit from reading Parts 2 and 3. The inexperienced should read all of these contents in the sequence presented.

The Varigraph is probably one of the most versatile of all mechanical devices for the production of display-type lettering. The owner of a Varigraph does not have to purchase various sizes of a particular style or type; once he purchases a single matrix he can produce many different sizes from it. A printer would have to stock thousands of one style of type to duplicate the sizes possible from the one Varigraph matrix. One average-size desk drawer could store a complete, 50 matrix Varigraph unit. This valuable space-saving feature can be appreciated by those stocking type, paste-up composing paraphernalia or photo-composing equipment. There is never any danger of running out of a particular letter in the middle of a job because Varigraph metal mats are extremely durable and the amount of work that can be produced from them is practically unlimited. A Varigraph owner need never worry about chemicals or light-sensitive papers which may go bad. Size of type is not usually a problem to him since condensed or extended lettering can be produced from the same matrix proportionately scaled to fit practically any given area. Other features relative to other Varigraph applications are too numerous to mention here.

The Varigraph is highly recommended for use by sign companies since it will produce sign layouts and sketches for presentations and projector enlargements quickly and easily. The maximum size Varigraph lettering is one inch, however, satisfactory photostatic enlargements of up to several times can be made. The smallest size Varigraph lettering is 3/64 inch. Precision processes such as steel engraving and etching usually require ultra-high degrees of precision and individualistic lettering.

No existing mechanical -- or photographic-composition method can displace the highly skilled handcraftsmen employed for such applications, and Varigraph Inc. does not pretend its equipment will do so, either. Between these two extreme standards of work, there is a wide variety for which Varigraph equipment is ideally suited. The standards naturally, will vary from shop to shop and job to job; the Varigraph operator should be able to recognize the differences so that important factors such as time, material, etc., will be in proportion to the job's requirements. For instance, an engineering drawing may look very nice all lettered in a Roman type-face such as 30U, however, if there is a considerable amount of lettering involved, the work would proceed much faster with a single stroke matrix such as 2UL. It may not look as nice as 30U, but for most standards of engineering drawings 2UL is acceptable. On the other hand, if a fine engrossing job is called for, it would be well to use something like the 30U because the appearance factor is more important here than on the engineering drawing. Usually, fine detail work calls for a fine lettering pen. A lesser standard of work will progress faster with a thicker pen. By being able to distinguish between the requirements of each job, the Varigraph operator will be able to take advantage of savings which can be made.

As with any device used by human beings, results from Varigraph equipment will vary somewhat depending upon the individual user's ability and application. Varigraph Inc. stands firmly behind the claim that anyone (with even less-than-average ability) using Varigraph equipment can start producing satisfactory results within an hour's time. Learning the operation of Varigraph equipment is by far much simpler than learning to drive, or to type, or to operate many of the business machines now being used by people of average ability. It is our contention that while talent is helpful, it is by no means absolutely essential. The initial lack of talent should not discourage the novice since his skill will most assuredly develop as he grows more and more familiar with this equipment.

From time to time, even the most accomplished Varigraph operator may run into problems or questions relative to the operation or application of his equipment. Varigraph Inc. invites all users of Varigraph equipment to submit problems and questions to us or to our agencies. We will continue to reply to all inquiries and endeavor to provide the best possible answers to them. We welcome comments and suggestions concerning this booklet and Varigraph equipment. Samples of work may be submitted also for our comments and appraisals.

Varigraph Inc. is ready to lend whatever assistance it can to its customers who are seeking to expand their services. Additional style charts may be requested for distribution among their own clientele, to facilitate the ordering of type. Suggestions for mailings will be given upon request. Mounted samples of work with business cards may be submitted for exhibition at various trade shows or to be used as sales samples.

PART 2 EQUIPMENT AND SUPPLIES

Style 34U

The novice Varigraph user will find that achieving proficiency with this instrument depends, in a large measure, on using suitable materials. Recommendations and acceptable alternatives are suggested herein.

LIGHTING. The value of good lighting should not be underestimated. It is essential to the prevention of eye strain and fatigue during long periods of work. An adjustable light source, such as the "LUXO" made by Luxo Lamp Corp. and available from Varigraph Inc. is well worth considering. A minimum of two 15 watt tubes is recommended, or, as provided in the LUXO, one 22 watt fluorescent and one 60 watt incandescent which may be used independently or in combination. Such lamps will provide good lighting and may be swung over the work as it progresses. This type of lamp, also, can be brought in close to the work and the angle adjusted for maximum lighting to facilitate detail operations such as filling-in.

WORK SURFACE. A good smooth work surface is a "must." Cluttered surfaces, or surfaces covered with particles of rubber cement, dust, eraser filings, spilled ink, etc., may not allow the work sheet to lie flat, and may cause dirt smudges on the work, difficulty in sliding the Varigraph along the straightedge, or prohibit the easy movement of the matrix within the Varigraph. Only good housekeeping habits will elimate them.

Most operators prefer a work surface with some degree of tilt. Drawing tables may be set to suit the operator's preference. The degree of tilt should never permit the Varigraph to slide off the board if left standing alone. Where a portable drawing board is used on a flat desk or table, the angle of tilt may be adjusted by either built-in props fixed to the underside of the drawing board, or by resting the board on books, blocks of wood or other objects of the desired thickness. Obviously, the built-in props eliminate the necessity of finding and adjusting the separate props every time the board is used. The Varigraph Composing Table (described on page 6 of the Varigraph Type Catalog) has adjustable feet to provide a good working angle when set up on a desk or any other flat surface. It is also a must item for those who require utmost precision in letter alignment and spacing between lines of type. Accurate line ruling for forms designing can also be performed. Composing Tables are also available with translucent surfaces for light table applications such as making color separations, tracing drawings, creating and reworking layouts, retouching negatives, etc. A curve attachment is an optional accessory for the Composing Table. With it, the user can perform lettering in arcs or circles. If a conventional board is used, it is essential that one side be straight and smooth to assure parallel lines of lettering as the T-square is moved.

Rough areas on the work surface may be sanded, providing such sanding does not cause objectionable hollows. Most drawing boards and tables are reasonably warp proof. However, if any doubts exist that a surface may warp, or its sections separate, one or two thin coats of white shellac should prevent this from happening.

In some shops the work surface may consist of a hard material such as glass. While certain problems like warping do not exist with this type of surface, care must be taken to handle the Varigraph carefully to avoid breaking the glass. As it is not possible to use tacks or pushpins to set the T-square or straightedge, it will be necessary to either tape the straightedge securely or use a locking device such as the Varigraph Boardlock T-square described in the Varigraph Type Catalog. The Boardlock T-square requires that a piece of channel (see Varigraph Type Catalog) be attached to the edge of your board or table top. If long lines of lettering are planned it is recommended that the T-lock (see Varigraph Type Catalog) be used with the Boardlock T-square.

T-SQUARE AND STRAIGHTEDGE. A good T-square or straightedge is most essential. The Varigraph Boardlock T-squares and Channel, described above, are designed especially for Varigraph use.

A straightedge is necessary to support the Varigraph as it moves from letter to letter; it is also used for achieving parallel lines of lettering. So it is imperative that the edge supporting the Varigraph be straight, and free from nicks, dents, warps, and any particles sticking to it. When using a T-square, be sure that the head is free from flaws, and is fixed firmly to the straightedge section. Any slack or play between these two parts will cause the lines of lettering to be out of parallel. In some cases slack may be eliminated by tightening the screws or providing additional screws. If this is unsuccessful, a new Boardlock T-square should be purchased. The length of the T-square is also important and is related to the length of the drawing board on which it is to be used. Where a Varigraph T-lock, described above, is used, the T-square must not be longer than the drawing board, or more than 1-1/2 inches shorter. Another way to determine the correct length of the T-square is to consider what the largest size of work to be performed will be and then add seven inches. This total will be the most desirable length of T-square, remembering again, that the length of the drawing board should not exceed this dimension or be less than 1-1/2 inches shorter. A T-square that is too long is difficult to handle; one that is too short does not permit the line of lettering to be completed.

Note the thickness of the straightedge to be used. The Varigraph has been designed so that practically any straightedge of standard thickness will underlap the base of the Varigraph and permit the peg-like feet underneath to slide in contact with the straightedge. Occasionally, however, a straightedge may be too thick to underlap the Varigraph. While it is perfectly satisfactory to allow the base of the Varigraph to slide in contact with such a straightedge, it may also be possible to lift the base of the Varigraph off the work surface and let it rest on the thick straightedge to form the underlap. It is important to remember that whichever method is used, it must be continued throughout all the lettering being done. Any change of the contact area of the Varigraph on the straightedge will cause a change in the alignment of lettering being done. A metal straightedge less than 1/16 inch thickness is not recommended because the Varigraph may accidentally slip over its supporting edge, or if unusually long, an annoying buckling may occur. Buckling of any straightedge may be remedied by securely taping or tacking the straightedge in place.

The beveled edge of a straightedge on which the Varigraph must ride may sometimes present a problem. While such bevels are not always objectionable, one might be, because the Varigraph might ride up and down the bevel while sliding along the straightedge, with the result of misalignment of the finished work. In such a case, try turning the beveled straightedge over, or inserting an extra long spare matrix between the Varigraph and the straightedge; the Varigraph will now ride on the matrix instead of the beveled straightedge. Naturally, the indexed edge of the matrix should be in contact with the bevel and the smooth edge in contact with the Varigraph.

Allowance must be made for the width of the matrix when securing the straightedge for each line of lettering.

Another type of straightedge is the parallel straightedge. This straightedge is permanently fixed to the drawing board. Parallelism is effected with strong metal cables or cords. The cables permit the straightedge to move up and down the work surface assuring a parallel setting wherever it is positioned. This type of straightedge must be positively secured with pushpins or tape to prevent springing, resulting in misalignment of lettering. A variety of parallel straightedges is on the market and most drafting or art supply houses will be able to provide information concerning the styles and sizes available.

CHAIR. A good comfortable chair with backrest, or a stool of the proper height will improve efficiency, particularly when there are hours of work to be performed.

STORING. Proper facilities for storing the Varigraph mats and accessories within easy reach will save considerable time and enable the operator to keep track of his equipment. If a Varigraph unit consists of only several mats and accessories, one desk drawer may be set aside to store everything. Units of up to 20 mats may be stored with the instrument in the handy Varigraph Combination Case (see Varigraph Type Catalog). Mats should be stored numerically so that they may be located with minimum effort. A pegboard with storage hooks is an excellent means of storing and can be decorative as well; all mats are in view and may be studied for selecting the best type in the group for a particular job, missing mats are also immediately apparent to the person in charge of the equipment.

PAPERS, ETC. The Varigraph has been successfully used on a great variety of papers, plastic sheets, and other surfaces too numerous to mention. As we are primarily concerned with its most popular application, which is display type for photographic reproduction, we have limited our discussion herein to suitable materials for that application.

Bristol board: Ideally suited for the photographic-reproduction process is a good, two-ply, plate-finish, white Bristol board (see Varigraph Type Catalog). This paper may be purchased in pads or in sheets depending on the amount needed and the size of work to be done. If the paper is of good quality, the operator will find he can make minor corrections with a razor blade, a scratchknife, or with white tempera paint. This paper will also stand considerable handling and can be pasted-up and lifted off repeatedly without tearing or serious stretching. One-ply plate-finish may also be used but it has less dimensional stability than two-ply, is semi-translucent, will not stand as much handling, and is more difficult for making razor blade corrections. Three-ply plate-finish costs more than two-ply and may cause shadows around the edges of the paste-up which will have to be retouched. The plate-finish papers are recommended because they permit the cleanest linework possible.

Illustration board: This paper invariably has a textured surface which will not permit the cleanest ink lines possible. However, if the finished work will be a reduction of the original, this should not be a serious handicap. It must be remembered that because of the extra thickness of illustration board, it is not suitable for paste-up purposes. All work on this material will, therefore, have to be done in exact position; for this reason, only a good grade of board should be used, to permit corrections, do-overs and other rough handling.

Tracing paper: This material comes in various grades and is sold in pads, sheets, and rolls. Most people use it only to make rough overlays and layouts. Many Varigraph operators use it to make trial runs, as described on page 12. For these applications, any cheap grade of tracing paper suitable for ink will do. There are, however, certain applications where the finished art must be executed on tracing paper which is then used as a contact positive for various processes. In such instances, the tracing paper must be of the best quality to provide dimensional stability and withstand corrections and other rough handling. It is suggested that your dealer be consulted regarding what is available for your application.

Frosted vinyl: This is an ideal material for preparing finished color separated work for photographic reproduction by the camera or contact processes. While vinyl is rather expensive for camera art, it is being used for that purpose by many people who like its great dimensional stability, durability and the ease with which corrections can be made. The frosted surface accepts ink very well. There are special acetate inks for this material (see Varigraph Type Catalog), but regular India ink works well; however, it is suggested that rough handling be avoided to prevent the India ink from chipping off.

Tracing cloth: This material is sometimes used for the same applications as frosted vinyl. There are many grades to choose from, and we again suggest that your dealer be consulted.

Clear acetate: This material is also used with very satisfactory results. Repeated corrections can be made and dimensional stability is very high. Best results will be achieved if top grade inks are used and if the operator will trace more slowly than usual to permit a heavier flow of ink on the surface.

NOTE: In all cases where acetate, vinyl and tracing cloth have been handled prior to use, invisible grease spots may exist. These spots will cause broken ink lines. It is therefore recommended that such sheets be dusted with talcum or pumice powder, or wiped with cotton saturated with alcohol. It is further suggested that a 10" x 14" piece of one-ply Bristol board always be kept under the straightedge and Varigraph to protect the work surface from oily hand-spots and to receive the rubbing of the mats and Varigraph as the lettering is done.

Craftint: Interesting line shading and Benday shading may be performed on this material. Craftint papers are sold in sheets. Various types of screen patterns are invisibly impregnated. These are brought out by applying solutions provided with the paper. Solutions may be used directly in the lettering pens of the Varigraph instrument. After some months the patterns do begin to fade, consequently a more permanent Benday method should be considered if the work is to be stored for future use.

Benday acetate sheets: These sheets have adhesive backings and are sold in many patterns and colors requiring various techniques of application. Generally, where a black letter on white background is to be screened, the Benday sheet will have an opaque white-dot screen. If the white background is to be screened, the Benday sheet will have a black-dot screen. Care in applying the Benday sheet is necessary; the sheet must lie flat and all air bubbles must be eliminated. Any well-equipped art supply dealer can provide details on screens available and methods of application.

Miscellaneous papers: It is recognized that there may be occasions when none of the above mentioned preferred papers, plastic sheets, etc., are available, or that the results of a particular job may not have to be up to usual standards of perfection and durability. Then the resourceful Varigraph operator will undoubtedly find that he is able to perform satisfactory work on lower grades of material. There are instances where ordinary letterhead paper has filled the requirements of the moment. This is mentioned not to encourage the use of sub-standard materials, but rather to encourage the resourcefulness and ingenuity of the operator.

INKS: The lettering pen used in the Varigraph requires no special kind of ink; an excellent black, waterproof ink is the Varigraph ink, available in hand-cartridge form (see Varigraph Type Catalog); this cartridge simplifies filling the lettering pen and also prevents flaking in the ink container. If a bottled ink is preferred, it is suggested that the bottle stopper be equipped with a dropper to facilitate filling the pens. Ink that is too old is difficult to use, particularly in the finer-line pens. The older ink is, the greater the evaporation that has taken place causing the ink to become too thick to flow easily. Often adding a few drops of water to the ink container will correct this difficulty without destroying the blackness of the ink. When an ink container has been used over a period of time, dried flakes may exist which will clog the pens; in this event, a new ink container should be provided. Other types of black and colored inks (see Varigraph Type Catalog) may also be used in the lettering pens, however, as their application for the photographic-reproduction process is too limited, they will not be discussed here.

MISCELLANEOUS EQUIPMENT: The following supplies are recommended to complete the materials necessary for the Varigraph operator doing work for photographic reproduction:

Masking tape or any kind of tape to hold the working sheet flat.

Thumbtacks or pushpins to secure a straightedge in position.

Two or three top-quality, pointed sable brushes for filling-in operations (see Varigraph Type Catalog).

A good India ink pen in place of the above mentioned brushes for filling-in operations. The Rapidograph pen (see Varigraph Type Catalog) is preferred by some while others like several different widths of Speedball points.

A jar of white tempera paint for making corrections (see Varigraph Type Catalog).

Pencils for making "rough".

Dust rag, drafting brush or tissues to keep work surface and worksheet clean.

Jar of rubber cement with brush attached, and an extra bottle of thinner.

A small oil can for rubber-cement thinner to pick up any work that was not pasted-up in the right position.

A good rubber-cement eraser and clean-up eraser.

Several single-edge safety-razor blades to trim out the finished lettering.

Esterbrook scratchknives for penholders are very useful.

Blunt-nose tweezers to handle small lettering cut-outs.

Ruler, draftsman's dividers and pencil and ink compasses.

Magnifying glass for any fine detail work to be done.

PART 3 LAYING OUT THE WORK

Style 81U

The Varigraph is the finest mechanical tool for the preparation of display type. Its great flexibility offers the operator practically unlimited choice of type sizes, shapes, spacing arrangements, and creative as well as formal lettering effects. For these very reasons it is the obligation of the operator to be able to select the right style, size, shape and lettering effect which will best fit into any given layout.

Many times it will be necessary for the Varigraph operator to prepare his own layout. Since no mechanical device has ever been produced for this task, and there is no lettering system in existence which can be used entirely without a layout, we suggest that the Varigraph operator devote some attention to the basic rules of good layout design which will assure greater success in his work. Obviously, the complete subject of layout design cannot be covered here; many books are available on this subject and it is suggested that the Varigraph operator interested in achieving the most from his efforts, consult the nearest library, art or book store about such material.

Following are some basic principles which the Varigraph beginner should know:

1 - Plan the lettering in the layout to have continuity. Avoid intercepting lines which may break the message or thought being delivered. A good layout will guide the viewer's eye in a planned direction through the entire message.

2 - Accent headings lend interest to the layout; however, too many can detract from one another. Subtitles and body copy should be proportionally accented to maintain interest.

3 - One trick effect such as curved or perspective lettering on a page is usually enough; this is not, however, an unbreakable rule.

4 - Three styles of type on a page generally are sufficient, however, there are exceptions.

5 - Lettering should always be of easily read size and shape. Too often one may be tempted to over-expand or over-condense letters to the point where certain styles in particular, lose their inherent beauty and may become practically impossible to read (see Figure 1). A good rule to remember when making your layout is to take advantage, as much as possible, of the basic proportions with which the matrix letter has been designed. Condense or expand the type just enough to meet requirements.

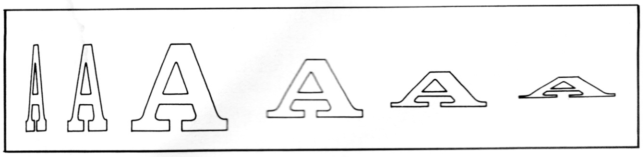


Figure 1

6 - Reverse-lettering effects usually should not be attempted with styles of type that have single and double lines, such as Bodoni Bold (34U).The thin white lines in the black field are difficult to keep open in the printing process. The use of a slightly heavier pen may overcome this objection (see Figure 2).

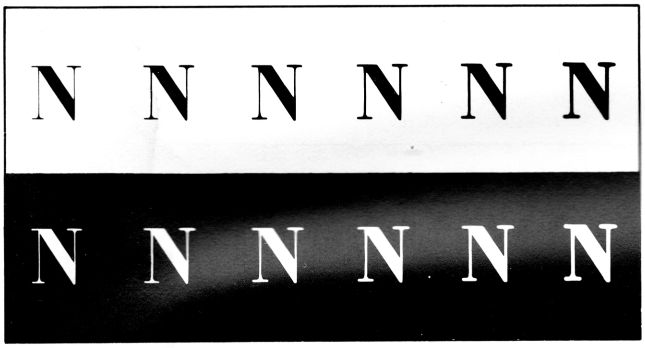


Figure 2

7 - Bold types, such as Futura Ultra Bold (92U), should be avoided where the finished product will be considerably reduced from the original. The small white areas - such as in the center of an "A" -- may fill-in solid in the printing process even though the original Varigraph lettering was clean and open (see Figure 3).

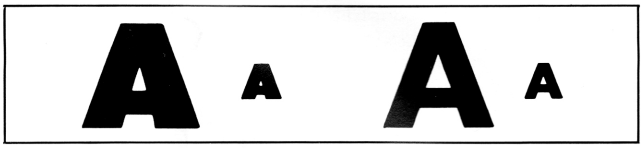


Figure 3

8 - Certain styles of type are appropriate for certain messages; for example, Commercial Script (54U and 54L) would go nicely in a perfume message; Stymie Extra Bold (81U) would go well in a advertisement for concrete blocks. Attempt to choose the style of type which is in keeping with the character of the message. This rule is most essential for major headings (see Figure 4).

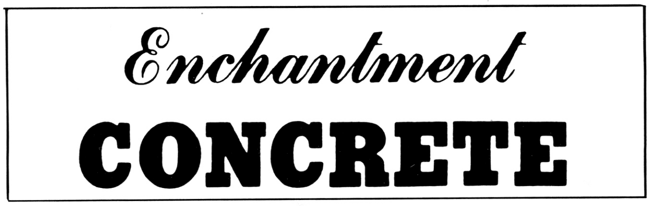


Figure 4

9 - When laying-out work that will be reproduced in color, ample clearance should be provided between colors that are not intended to butt each other. Where colors are intended to touch each other, it is usually advisable to include a dark key-outline between them. This outline should be wide enough to cover any overlapping of the other colors which may occur in the printing process (see Figure 5).

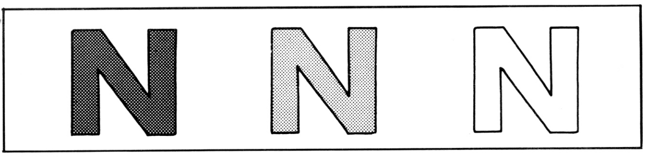


Figure 5

In many offices the preparation of lettering art is very formal and standardized. In such places one can find Varigraph operators who, in one step, without the aid of a layout or guide for sizes and styles to be used, can take a sheet of scribbled copy and convert it into finished type. In other organizations the proficiency of the Varigraph operators is such that only skeletal "roughs" are required to turn out the finished work. Where the work is of a more complex nature, a carefully prepared layout is essential; not only will it improve the over-all appearance of the job, it will also eliminate errors in body copy and illustrated material which may have to be ordered for the finished job. The Varigraph operator will also find a layout very useful for determining lettering styles and size settings he must use, and thereby he will eliminate many hit-and-miss attempts.

Where a layout allows some leeway for size of type and length of line, the Varigraph operator, even with only a little experience, may be able to set the size controls of the instrument and produce a line of copy that will fit satisfactorily. However, if the copy must fit precisely, a careful rough and/or one or two trial runs of the text may be necessary. In a trial run, do not bother to trace all parts of each letter. To save time, it is only necessary to trace the extreme right and left extremity of each letter. If the trial is reasonably close to the required length, it may be used as a guide to put position points for each letter on the work sheet. On long lines of small lettering, it may be necessary only to put a position point for the first letter of each word. Of course, as the position points are being marked off from the trial run, slight adjustments can be made in the word or letter spacing to bring the total length of the line closer to the required size. Slight additional adjustments can be made as the finished lettering is being performed.

PART 4 THE VARIGRAPH

Style 99U

The Varigraph is precision-built to tolerances of less than 0.0003 of an inch. Its corrosion-resistant parts and linkage are hand-assembled by highly skilled instrument makers. Each instrument is thoroughly tested for accuracy before shipment. All small parts are extremely rugged, therefore, many years of hard usage are obtainable providing the mechanism is not subjected to unusual abuse.

It is recommended that the guarantee card provided with each Varigraph be returned to the factory as soon as shipment is received. This card registers the serial number of the Varigraph in the name of the purchaser so that should any servicing ever be required, no question can arise as to proper ownership or the terms of the guarantee.

MODELS: There are actually two models of the Varigraph.

The Office Model will produce hundreds of variations of proportionate, condensed and expanded sizes from any matrix.

The Italic Model is identical to the above, but has an extra control for producing thousands of variations including forward, and back slanting lettering and, therefore, is the more versatile of the two.

For purposes of simplicity, this manual refers to both models as the "Varigraph".

SERVICING. The Varigraph requires very little attention or servicing. It is recommended, however, that the operator avoid undue wear of the instrument by tracing matrices with a light touch and at a moderate rate of speed. A heavy hand, traveling at excessive speed will subject the mechanism to a small shock at the end of each straight stroke. While the sum total of such shocks will rarely result in sudden failure of any part, over a period of time it might affect the accuracy of the mechanism, necessitating servicing.

STORING. When storing the Varigraph after use, the following steps are recommended:

1 - Set the size-control knobs at .150 x .150.

2 - Slip a rubber band over the tracing point and pull it underneath the Varigraph and slip the opposite end up over the pen arm.

3 - Replace Varigraph in its case or box to protect it from dust and other foreign particles. In this position, the Varigraph can be transported and will withstand maximum buffeting.

CLEANING. Annual cleaning and oiling of the internal mechanism by Varigraph Inc., Madison, Wis., is recommended. Prolonged use of a Varigraph needing service may result in more serious damage. Varigraphs are available on loan during a period of repair at the factory.

Removal of the Varigraph's cover is not recommended, but there may be occasions when an operator may need to do so. For example, he may wish to remove some foreign object that may have accidentally fallen into one of the openings. If immediate use of the Varigraph is imperative, he may attempt to remove the cover at his own risk. The only tools necessary are a standard screwdriver and a screwdriver small enough to fit the setscrews in each of the size-control knobs. After loosening these setscrews a few turns, these knobs can be pulled from their shafts. Now remove the plastic pen-lift knob by twisting it straight upwards. Remove four screws in the underside of the Varigraph with the regular screwdriver. Hold cover on the Varigraph until it can be placed on the table right side up. The cover may now be removed. Care should be taken that no other parts are removed. The Varigraph should not be turned upside down while the cover is off.

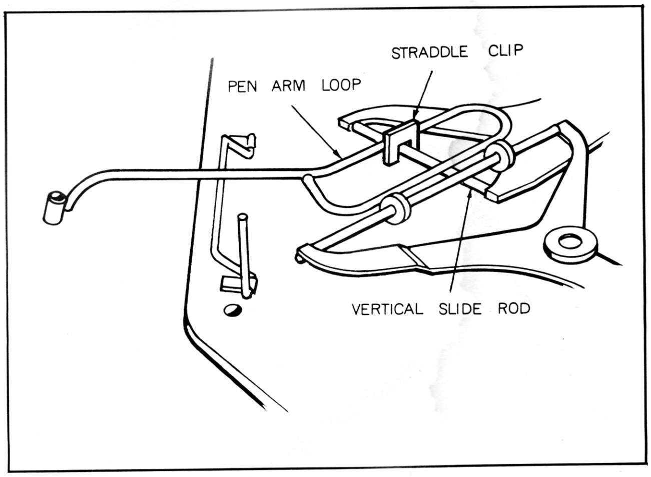


Figure 6

To replace the cover:

1 - Make sure the straddle clip (soldered to the pen arm loop) engages the vertical slide rod before replacing cover (see Figure 6).

2 - Position pen-lift lever so it lines up with its corresponding slot in the cover.

3 - Position plastic size-control indicators so that the white indicator line on each is facing the outer edge of the Varigraph.

4 - Gently slide cover down into position, making sure that the size-control indicators and the pen-lift lever fall into their corresponding slots.

5 - With palm of left hand face down on the center of the cover and the fingers curled over the base and straddling the pen arm, turn the Varigraph up on edge, and replace the four bottom screws. Screws should be tightened very slightly.

6 - Turn the Varigraph right side up. Replace size-control knobs and tighten their setscrews. Note that setscrews must be lined up to seat properly in the spotted shafts. As the setscrew is turned, the knobs should be rocked back and forth so that the setscrew will seat at the very bottom of shaft cavity.

7 - Replace plastic pen-lift knob. Do not jam this part all the way down as some clearance is necessary to permit movement of the pen-lift lever. Any Varigraph operator can adjust the amount of tension he wishes applied to the mats. This tension is applied through one of the flat springs on the underside of the Varigraph. Two springs are provided -- for either right -- or left-hand operation. If the mats do not slide easily through the Varigraph, the appropriate spring may be bent by hand to decrease tension. Bend the spring in the opposite direction if the mats tend to move while being traced. Proper tension is achieved when there is just enough to keep the mats from moving during the tracing (see Figure 7).

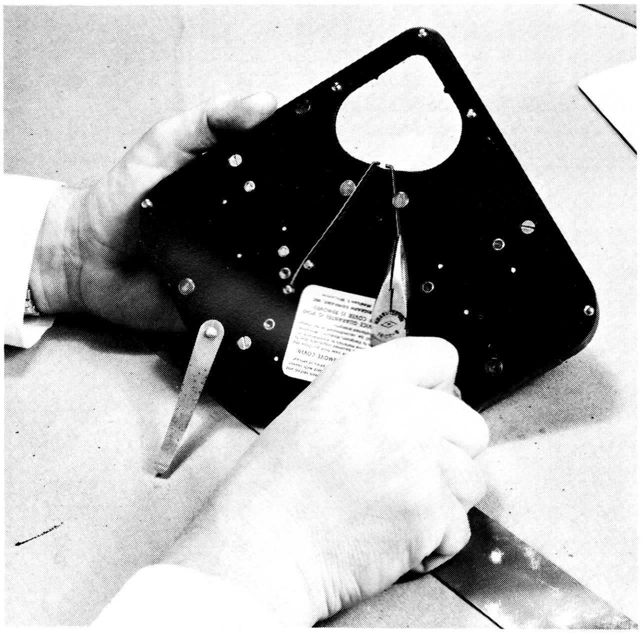


Figure 7

TESTING. Damaged Varigraphs, Varigraphs that have lost their accuracy, or Varigraphs that are difficult to operate should be returned to the factory for checking. Keeping a faulty Varigraph in operation can result in additional costs for repair as well as the possible loss of the use of the Varigraph at a critical time. Should there be any question about loss of accuracy, the following test can be made to determine whether a Varigraph is in need of factory inspection:

1 - Insert any full-size, upper-case Gothic-style matrix in the Varigraph. A matrix having a complete double outline, such as the 91U, will do very well.

2 - Set dials on the instrument to .750 x .750.

3 - Insert a No. 000 pen or the next finest-line pen available, and add ink.

4 - Trace the letter "S" (with pen in the writing position) in a clockwise direction, being careful to maintain the stylus pressure against the outside wall of the matrix groove.

5 - When the starting point is reached, do not raise the pen, but retrace the letter in a counter-clockwise direction, again being careful to maintain stylus pressure toward the outside wall of the matrix groove.

6 - Retract the pen immediately after reaching the starting point. Note the result of the reproduced letter. The outline may be slightly thicker and thinner at certain points; if no white shows in any part of the black outline, the Varigraph has not lost accuracy. If there is white showing at any point in the black outline, the Varigraph should be checked at the factory.

When running the above-described test, it is important that the letter be traced only once in the clockwise direction and once in the counter-clockwise direction.

MATS. Formerly, Varigraph mats were engraved in a triple laminate plastic having a black center core and white outer surfaces. The use of this material has been discontinued mainly because of its high inflammability and flammability hazard in the engraving plant. People owning such mats are cautioned to observe common sense precautions concerning combustible materials. Varigraph mats are now engraved in a light metal alloy which has completely eliminated the above mentioned dangers. In addition, dimensional stability has been increased and they resist all types of wear much better than plastic mats. All mats should be stored in the sheaths provided for them. This will minimize chances of foreign particles becoming lodged in the letter grooves. When not in use, the mats should be stored in such a manner to prevent their being bent or warped out of alignment. Mats that are sent through the mails or otherwise transported should be wrapped to a strip of wood or other stiff backing to prevent bending. Mats which stick in the Varigraph only at certain points, probably have become slightly bent; in most cases they can be straightened with a little careful pressure at the right points.

Some Varigraph operators find that rubbing a little candle wax on both sides of the mats facilitates its movement in the Varigraph instrument. Such waxing should be done very sparingly so that the worksheet will not pick up any wax stains.

Dirty mats can be cleaned with soap and warm water. Stubborn spots may be removed with kitchen scouring powder. Should any of the enamel become chipped or scratched, it will not affect the operation of the mats whatsoever.

New mats may have tiny ridges or little pits at the bottom of the grooves. These are due to the engraving operation. Whenever encountering such rough spots, trace over them as lightly as possible to complete the letter, then, with the pen off the paper, retrace the rough area back and forth with a little more pressure.

This will help smooth out the roughness. The more usage given a matrix the smoother and easier it is to trace.

Letters are arranged on the mats according to frequency of occurrence. The inexperienced operator may find this a little disturbing at first, however, after a short time he will find that this system eliminates considerable shifting from one end of the matrix to the other for often-used combinations such as "ATE", "ULY", etc. Placing a second matrix above the work being performed, may help. This matrix may now be used as a reference for locating positions of letters. Varigraph Inc. offers its engraving facilities for preparing custom mats including special type faces, foreign alphabets, trade marks, monograms, symbols, etc. Estimates will be given on all samples submitted. However, in most cases precisely drawn and enlarged working copy will be required from the customer for the finished work.

CAPILLARY PENS. The pens used in the Varigraph are available in twelve line-weights. Each pen consists of a barrel and a cleaning pin. As with any implement designed for using India ink, these pens are subject to clogging if they are not properly cleaned before the ink within becomes dried. An excellent device for maintaining the pens in working condition is the Varigraph Pen Tank, described in the following text. If this device is not used, it is recommended that the pens be allowed to soak in a warm solution of soapy water, or, better still, is the Pen Tank Cleaning Fluid (see Varigraph Type Catalog). Never attempt to clean pens with solvents such as turpentine, benzine, alcohol, etc. If India ink has dried hard in the pens, a small amount of ammonia may be added to the cleaning solution. As it may be necessary to soak such pens for several days, enough solution should be prepared to allow for evaporation. In extremely stubborn cases, new solutions may have to be prepared to soften the ink. The use of ammonia should be restricted to cases of hardened India ink.

After soaking pens thoroughly, rinse in clear water. Exercise care when handling the fine needle-like cleaning pins. Should they bend, they may be straightened; however, after repeated bending and straightening, they will of course, finally break. When cleaning pens over a wash basin, it is recommended that basin stopper be in place to prevent dropped parts being lost down the drain. All visible ink spots should be removed from the cleaning pin and the tube. To determine if the tube is clean, blow out the water and hold it up to the light. If no light can be seen coming through, insert the cleaning pin and check to see if the wire tip protrudes through the tube. No pressure should be applied or the wire tip of the cleaning pin will buckle. In some instances the cleaning pin may be reversed and the wire tip carefully pushed into the tube from the opposite end. This may help to locate an obstruction. Rinse and blow out the water until light can be seen through the tube. The cap on the cleaning pin can be used to clean out any stubborn ink spots that may be in the upper section of the tube.

Sizes of the pens are engraved on the sides of the tubes and on the tops of the cleaning pins, consequently, there is no possibility of mismatching the parts when several sizes are being cleaned.

The pen should never be filled with more than two drops of ink. Over-loading pens will result in small blobs of ink at the beginning and ending of each line. Start the pen flowing on a piece of scrap paper by drawing the paper back and forth with the pen lowered. When ink is flowing properly, work may begin. If there is any difficulty in starting the pen, twist the cleaning pin. When fully seated, the cleaning pin protrudes through the tube and slightly past the tip. When the tip touches the paper, the pin is unseated and thus permits the ink to flow. If the pin is severely bent, it will not unseat and the ink will not flow. If the pin is functioning correctly and the pen was properly cleaned before being used, the ink should flow without difficulty. If not, refer to the paragraph on inks on page 4. Only a fraction of a minute can elapse between making letters with the fine pens before ink on the point will dry enough to prevent flow. The plunger must then be dry enough to prevent flow. The plunger must then be actuated to break the dried ink on the end of the pen. A good way to do this is to drag a piece of scrap paper along with the pen in contact.

When you wish to stop lettering for only a moment, it is suggested that you slide a small card under the pen and lower the pen on the card, even drawing the card along under the pen, to be sure the ink is flowing, and leave the pen in this position. The point is now sealed, and when you begin lettering again, the ink will flow immediately. This procedure is effective in maintaining the pen operative up to a half-hour of no lettering. Before you again start to use the pen it is suggested that you remove the pen from the Varigraph and roll the point along a piece of paper to remove the crusted ink from the point. If you do not do this the pen is apt to make a much wider line than it should.

PRODUCTION PENS. Varigraph Production Pens are most convenient to use on one filling. They provide several days lettering or more depending on the point size being used. Drying out is retarded to a maximum since the ink reservoir is sealed. When your lettering work is momentarily interrupted, we suggest you lower the Varigraph pen arm onto a scrap piece of paper. This seals the point until you return. If you have refrigeration available (not deep freeze) these Production Pens may be stored therein after use for several days and still work immediately after vigorous shaking. For inoperative periods of storage exceeding a week, we suggest disassembly and thorough cleaning. See instruction slip furnished by the manufacturer with each pen.

CA85 CURVE ATTACHMENT. This device buttons over the peg-like feet on the underside of the Varigraph. For lettering on an inside curve having a radius from one inch to seven inches the curve attachment fastens to the upper side of the Varigraph. For lettering on an outside curve having a radius from six inches to twelve inches the curve attachment fastens to the lower side of the Varigraph (see Varigraph Type Catalog). The desired arc of lettering is performed by putting a thumbtack through one of a series of holes in the curve attachment and then pivoting the Varigraph around the thumbtack from letter to letter.

PEN TANK. This handy accessory safely stores used pens which you do not want to take the time to clean immediately. It is also used to advantage to soften the dried ink in pens which have been left exposed to the air for many hours. The cleaning fluid left in the pens after removing from the pen tank must be flushed away with water before adding ink. This device is a pen insurance policy (see Varigraph Type Catalog).

CONVERSION CHART

Varigraph Settings	Compared To	Type Point Sizes
.750 - 3/4"		72 pt. approx.
.625 - 5/8"		60 " "
.500 - 1/2"		48 " "
.437 - 7/16"		42 " "
.375 - 3/8"		36 " "
.312 - 5/16"		30 " "
.250 - 1/4"		24 " "
.187 - 3/16"		18 " "
.156 - 5/32"		14 " "

When using a half-scale matrix the lettering will be one-half the indicated Varigraph settings.

When using a one inch matrix the lettering will be one-third larger than the indicated Varigraph settings.

PART 5 VARIGRAPH OPERATION

Style 685U

BASIC OPERATION. The inexperienced operator will find the basic operation of the Varigraph comparatively simple. The average person will be able to produce satisfactory results after 15 minute's practice. However, speed in setting-up and the ability to accomplish special effects will improve with additional use. The information contained herein is intended to aid the new operator in his initial efforts, and start him toward attaining maximum proficiency in minimum time.

The first recommendation to the beginner is that he allow himself the 15 minute's practice before attempting to produce any finished work. This will enable him to get the feel of this equipment. For right-hand operation (tracing stylus in lower right corner), slide the matrix under the Varigraph from the left side being certain that it goes between the supporting feet which receive the matrix and retain it with the Varigraph. Six basic steps in operating the Varigraph follow:

1 - While holding the Varigraph stationary with the left hand, slide the matrix with the right hand to position the desired letter in front of the pointer on the base of the Varigraph. See Figure 8 .
2 - With the right hand, position the tracing stylus in the groove at a point in the extreme left side of the letter. Apply only a very slight pressure on the tracing stylus but do not allow it to come out of the groove before completing all of the remaining steps.
3 - Observe position of the pen and slide the Varigraph with the left hand until the pen hovers over the point at which you want the left side of the letter to begin.

Note: The tracing stylus must be held lightly in the groove so that the matrix will move along with the Varigraph and the desired letter will remain in the proper tracing position.

4 - With the index finger of the left hand, push the pen-lift lever fully forward to lower the pen. Never use your right hand on the pen-lift lever if you are right handed.
5 - Begin tracing immediately after the pen touches the paper. Trace around the letter just once. If the pen did not write, retract the pen and raise the needle-like cleaning pin slightly up and down once or twice. Retrace the letter according to the above instructions.

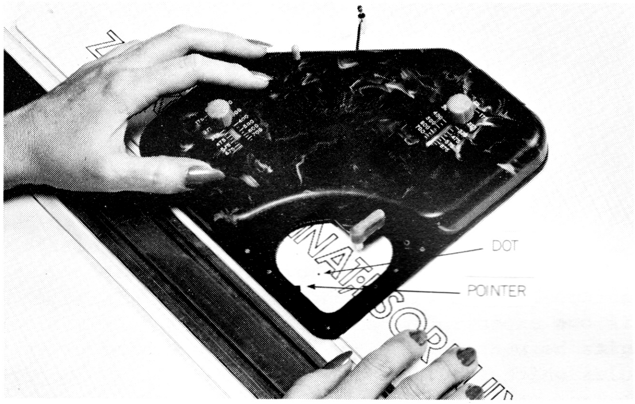


Figure 8

6 - With index finger of the left hand, retract the pen-lift lever to raise the pen. These six steps will suffice for the first practice session.

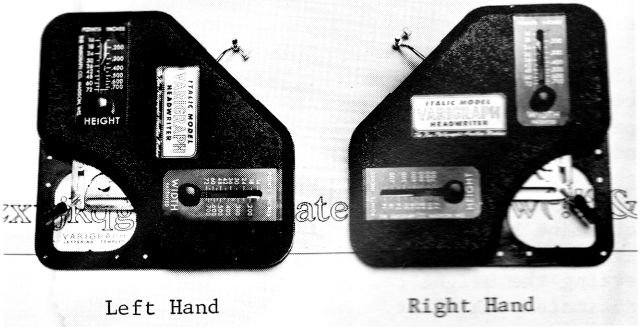
SETTING UP. The following information is designed to assist the novice with setting up and the detailed operation of Varigraph equipment. We believe it will also aid him in achieving considerable finish to his work.

1 - Use a piece of paper large enough for the Varigraph to remain on it all times. Fasten the paper to the worksurface. It should be squared up with the straightedge and fastened down with tacks or tape. Stretch the paper as it is being fastened so that it will lie smooth and flat. Care should be exercised in positioning the tacks or tape so that they will not come in contact with the movement of the matrix or the Varigraph. An extremely efficient way of fastening the paper is to use double-faced masking tape on the underside of the worksheet. This tape eliminates possible snagging with the Varigraph or the matrix and will leave no marks on the good side of the worksheet.

2 - The height control knob on the Varigraph may now be set for the desired height lettering. The operator should bear in mind that both the height and width controls are calibrated in thousandths scale where precise sizes are required. The conversion chart shown on page 10 should be useful to determine height control settings. I. E.: If we needed a 7/16" high letter, the chart specifies setting the height control at .437 which is, approximately, a 42 pt. type. With this setting, we will now get exactly a 7/16" high letter using any standard 14-72 pt. upper case matrix, and a #0 pen. If a half scale 7-36 pt. matrix is used, the resulting size upper case letter will be 1/2 the size (7/32"). Other size mats will vary the results accordingly. When such mats are being used, or, when attempting to match some odd-size type, position the Varigraph (with dry pen and desired matrix inserted) over a letter in the line of type being matched. Then, by tracing the same letter on the Matrix, you can observe if the pen is matching the height and width of the desired type. By making adjustments of the height and width controls, you should be able to match the type size. Another method for matching sizes is to letter a trial size on tracing paper, then lay the trial size over the type being matched. Make all necessary corrections of height and width and make new trials as necessary.

3 - The width control is now set for the desired size. Of course, this control will not produce a uniformly wide letter. "I"s and "J"s will be narrower than "M"s and "W"s. There are also considerable differences from one style of type to another. It should be remembered that when the height and width controls are set at identical numbers, the reproduced lettering will be in the same proportion as the matrix being used. Should there be any question concerning the correct width setting to use, we suggest you refer to the last paragraph of Part 3 on Page 6 .
When the Varigraph is set up for left handed operation (see Figure 9), the height control will regulate the width of the letter and the width control will regulate the height.
If there is any possibility that a certain size of lettering will be used again in the future, the operator should keep a record of the setting used on the original work.

4 - The operation of the italicizing control on the Italic Model Varigraph consists of loosening the lock screw on the tracing plate, then, rotating the adjusting plate to the desired forward or back-slant setting and tightening the lockscrew (see Figure 10). Remember a back slanted slot in the tracing plate makes forward slant letters and a forward slanted slot makes back slant letters. The degree of slant is determined by three factors; 1-the setting of the Italic control; 2-the setting



Left Hand Right Hand

Figure 9

of the height-width controls; 3-the slant, if any, of the engraved letter on the matrix. When the height-width controls are set on identical numbers and the engraved letters on the matrix are not slanted, the graduations on the Italic control represent 5 degree variations from the vertical. After setting the Italic control, we can further increase the slant by resetting the height-width controls for a wider proportioned letter, or, decrease the slant by resetting height-width controls for a narrower proportioned letter. When using mats that have forward slanted letters, the slant will be increased when the Italic control is in the forward settings and decreased in the back-slant settings.

The use of the italicizing control slightly reduces the area which the tracing stylus can cover. In most cases, this is no problem. However, when unusually wide letters, or, the larger 19 to 96 point mats are being used, it may be found that the stylus will not cover the letter. To correct this, it is suggested that just prior to lowering the pen for the ink work, a trial run be made through the matrix letter to determine if the stylus will reach all parts. If the stylus cannot reach all parts, it may be possible to correct this by moving the matrix letter slightly off its centered location in front of the pointer on the base of the Varigraph. If this is done, care must be exercised during the tracing operation not to move the matrix. This is due to the fact that when the matrix was moved off center, the index spring on the bottom of the Varigraph no longer engaged the index notch on the top edge of the matrix to steady it while tracing. If moving the matrix still does not permit the stylus to reach all parts of the letter, it will be necessary to split the letter into two parts. The letter is positioned in the Varigraph so that the stylus can trace the entire left hand portion (always try to start and finish at the end of a straight line). After the left side is inked, the letter is moved so that the stylus can trace the remainder of the right side. The Varigraph is moved so that the right side will either butt and/or overlap the left side on the paper. This procedure may cause a slight distortion or variation of slant, but, in most cases, it will not be too noticeable.

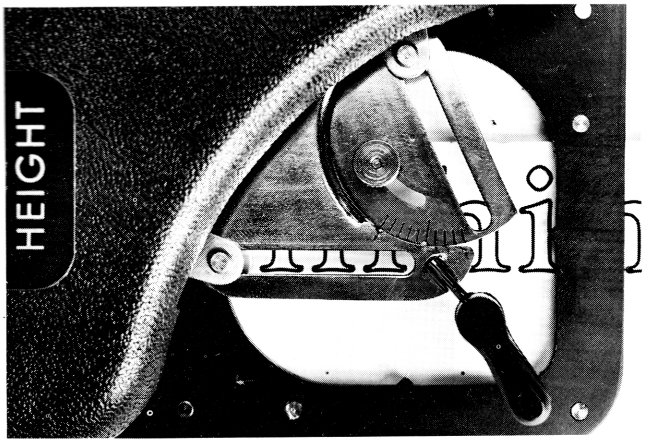


Figure 10

To return the Italicizing control back to the normal vertical lettering, simply loosen the lock-screw and move the adjustable plate so that its small semi-circular hole lines up with the small semi-circular hole on the tracing plate. A handy means for doing this is to insert a pointed device such as the tracing stylus into these semi-circular holes to keep them lined up while the lock-screw is tightened. Be sure the moveable plate is resting properly on the tracing plate and that the lockscrew is tightened. Failure to check these points may result in distorted lettering and/or difficult operation of the tracing plate. The Italic control may not be used for left handed operation of the Varigraph.

5 - Selection of the correct size of pen is the next consideration. There are no hard and fast rules concerning the size of pen to be used in any instance. Each Varigraph operator will learn from his own experience which pen will produce the results he wants. However, there are some general rules which should guide your selection. For instance, never attempt doing small lettering with a heavy pen; the reproduced letter will end up as a blob of ink, or the centers of certain letters such as "A's" and "B's" will not remain clean and open. When in doubt about how a certain size pen will perform, make a test with the pen and the letters in the matrix that are most likely to cause difficulties. If such letters reproduce clean and open, the pen is satisfactory; if they fill in, use a finer-line pen (see Figure 11).

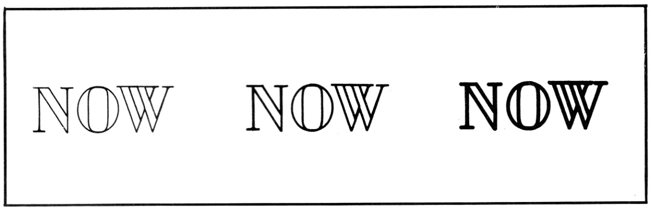


Figure 11

The finest-line pen is No. 0000. The next heavier-line is No. 000, then No. 00, No. 0, and Numbers 1 through 8 (which is the widest line available).

Heavy pens tend to produce rounded corners at line endings. For this reason, many Varigraph operators prefer to use only the finer-line pens for all work. Very broad pens also tend to use up their ink supply rapidly so that if there is considerable work to be done, such pens will have to be refilled quite often. However, consideration must be given to the fact that the heavier the outline, the easier the filling-in operation becomes. With these thoughts in mind, the Varigraph user should be able to narrow his selection to two or three pen sizes and with practice to make selections with less and less difficulty. See Figure 12 on next page.

Inserting the pen into the Varigraph is a simple operation. With the left hand, hold the pen arm in the up position. With the right hand, insert the pen into the pen ring, then lock in position with the setscrew.

6 - Remove the needle-like cleaning pin from the pen barrel and place a piece of scrap paper under the barrel. Insert one, or two drops of ink and replace the cleaning pin. Move the pin up and down slightly once or twice to start the ink flowing. Lower the pen on the scrap paper and operate the stylus to make sure the ink is flowing. Repeat the up and down movement of the cleaning pin at any time the ink stops flowing. The beginner may have to do this often at first because he may not be able to work at a steady pace. India ink will dry in any device not used often. If the pen continues to clog at intervals of less than 15 seconds between use, refer to pages 5 and 9 to determine the difficulty.

If the end of the pen should accumulate particles of dirt and paper lint while being used, the line made by the pen will become thicker. To avoid this, wipe the worksheet with a clean rag or tissue before starting the lettering. Periodic wiping of the pen tip will also help.

7 - In selecting the proper matrix, first consideration must be given to style. Next consider how it will look at the desired size. (Refer to the discussion on page 6 .)

To insert the selected matrix, set the Varigraph on the work surface and hold it with the right hand. With the left hand, firmly push the matrix through the left side of the Varigraph. Note that the matrix must be lined up straight to pass between the parallel rows of feet on the underside of the Varigraph, otherwise the leading end of the matrix will strike the feet.

8 - The next step is to fasten the straightedge firmly to the worksurface. If the lettering must begin at a certain point on the worksheet, the following procedure should be used. Put a faint pencil mark on the worksheet where the lower left corner of the first letter should begin. If the first letter happens to be a round letter such as an "O", put the mark where you want the center of the bottom curve to fall. Next place this same letter in tracing position in the Varigraph and set the size-control knobs to the desired height and width. Hold the stylus in the groove at the point in the letter corresponding to the pencil mark you have indicated on the worksheet. Now lower the pen so that it almost touches the worksheet, then position the Varigraph so that the pen will hover over the pencil mark. Make certain the stylus is still being held down in the correct point on the matrix. The straightedge is then to be brought up under the Varigraph and secured so that it will support the Varigraph. After securing the straightedge, a final check should be made to see that the pen will begin lettering at the desired point. Problem straightedges are discussed on page 3 .

9 - Trace the first letter several times before lowering the pen. This will give the new user an idea of how little pressure on the stylus is necessary. It will also allow him to adjust the upper-right paper-hold-down spring (swung out from underneath) to a point close to, but not interfering with, the pen movements. The hold-down spring serves to flatten the worksheet and thereby prevents distortion of the letters. Hands should rest on the straightedge so that there is practically no weight on the tracing stylus or the Varigraph. Try to rest the arms on the worksurface.

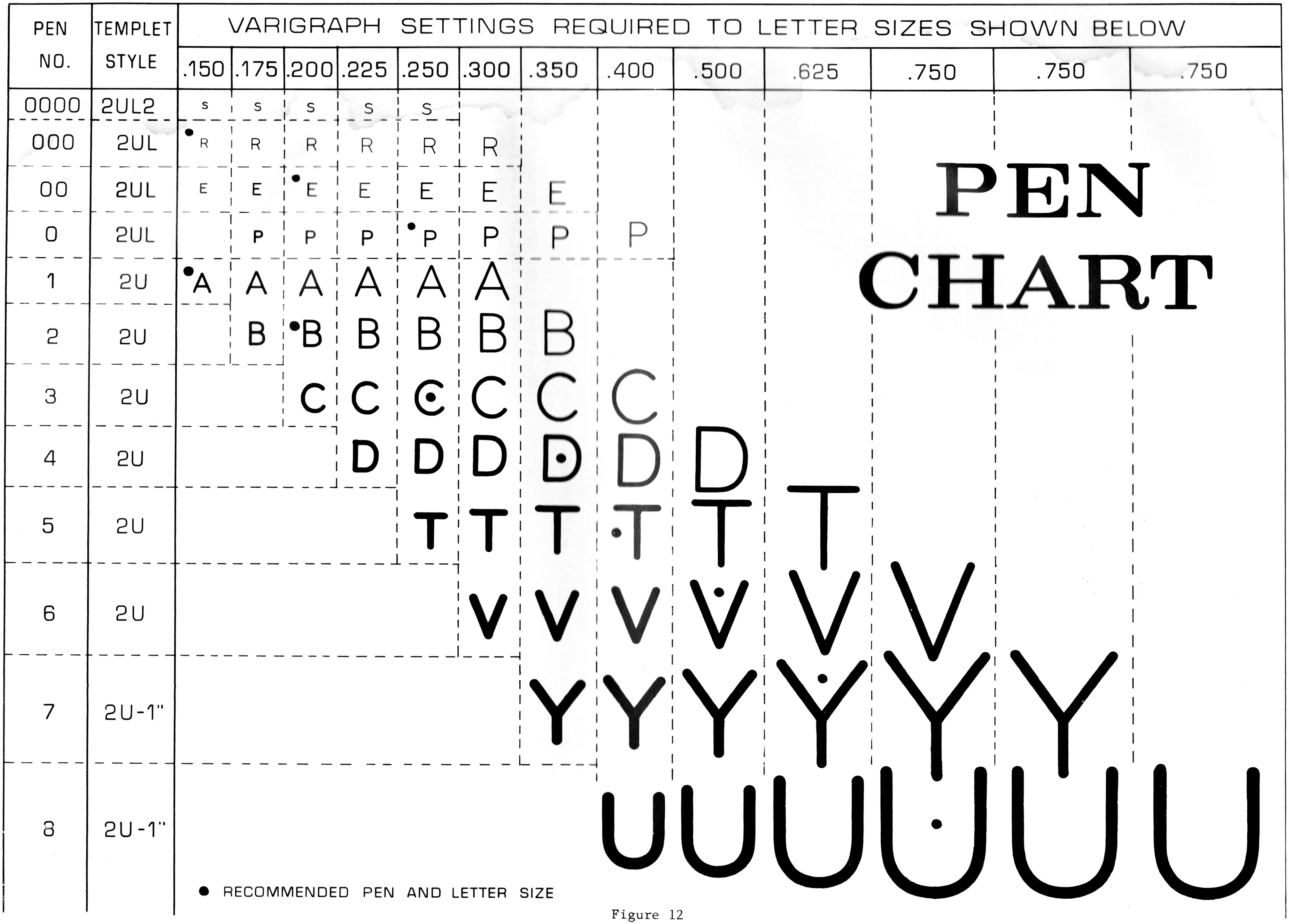
10 - The first letter may now be made. Before lowering the pen, be certain the tracing stylus is positioned in the groove of the desired letter. The pen-lift finger (index finger of left hand) may now push the pen-lift lever fully forward. Immediately thereafter tracing is begun. The pen will stay down until the lift lever is brought back. It is a good idea to keep the pen-lift finger close to the lift lever so that it may lift the pen off the paper immediately after the letter has been completed. If the pen remains on the paper after completing the letter,a blob of ink may form at the pen. Unless the pen is lifted it will continue marking the paper when the Varigraph is moved for the next letter. This will necessitate retouching.

11 - The next letter is now moved into tracing position. Note that the finger tips of the right hand are all that are needed to move the matrix while the left hand holds the Varigraph stationary. If the matrix does not slide easily, see page 8 and page 9 . The letter is in tracing position when it is above the pointer on the base of the Varigraph and the operator feels the locking action of the tension spring as it engages a notch on the indexed edge of the matrix.

12 - The tracing stylus is now held down in the letter at a point which will come closest to touching the previous letter. Pressure on the stylus should be very light, and it is most important to remember that from this point on the tracing stylus must never be allowed to come out of the groove until all the following operations are finished and the pen is retracted from the paper.

SHOWS ACTUAL SIZE LETTERS MADE WITH DIFFERENT SIZE PENS.

PEN CHART



PEN NO.	TEMPLET STYLE	VARIGRAPH SETTINGS REQUIRED TO LETTER SIZES SHOWN BELOW												
		.150	.175	.200	.225	.250	.300	.350	.400	.500	.625	.750	.750	.750
0000	2UL2	S	S	S	S	S								
000	2UL	● R	R	R	R	R	R							
00	2UL	E	E	● E	E	E	E	E						
0	2UL		P	P	P	● P	P	P	P					
1	2U	● A	A	A	A	A	A							
2	2U		B	● B	B	B	B	B						
3	2U			C	C	● C	C	C	C					
4	2U				D	D	D	● D	D	D				
5	2U					T	T	T	● T	T	T			
6	2U						V	V	V	● V	V	V		
7	2U-1"							Y	Y	Y	● Y	Y	Y	
8	2U-1"								U	U	U	● U	U	U

● RECOMMENDED PEN AND LETTER SIZE

Figure 12

13 - With the tracing stylus positioned in the desired letter, the Varigraph is moved along the straightedge with the left hand for spacing. The matrix will be carried along with the Varigraph and will remain locked in tracing position providing neither hand is resting on the matrix and that finger tip pressure is used to hold the tracing stylus in the groove.

The amount of spacing for the next letter is best determined by eye. The subject of letter spacing is discussed on page 17. It is important that the Varigraph be moved enough to prevent the next letter from overlapping the previous one.

It is usually a good idea to operate the pen-lift lever so that the pen hovers as close to the paper as possible without touching. This will give the operator a better idea of where the next letter will begin in relation to the last one. If there is any doubt concerning the spacing, trace the entire left side of the new letter and note where the pen forms it in relation to the last letter.

14 - When the correct spacing has been accomplished, the next letter may be made. The knack of tracing a matrix can be acquired by anyone; however, there are some points to observe that will aid in achieving superior results. The following pointers should prove helpful to the beginner:

a - Tracing should begin and end in a corner of the letter, preferably a lower corner. With the letter "O", it is a good idea to start tracing the matrix before lowering the pen. When the "O" is completed, raise the pen before stopping the tracing operation.

b - Tracing may proceed either in a clockwise or counter-clockwise direction. It is best to choose one or the other and not change.

c - The lighter the touch on the tracing stylus, the less friction is created and the easier the letter is to trace. No matter how easy the tracing becomes, avoid tracing at excessive speeds that will subject the Varigraph mechanism to shock at the end of each stroke and cause insufficient ink to flow.

d - All parts of the letter must be traced to be reproduced. Serifs (the small projections on Roman type faces such as the 3U) must be fully traced. Incomplete tracing will require a time-consuming operation of dubbing-in afterwards.

e - Avoid retracing lines whenever possible. Retraced lines may become heavier than once-traced lines. In certain styles of type, such as the Roman family (3U, 34U, 30U, etc.,) some retracing may be unavoidable.

f - The new operator may find Roman type letters such as the 3U more difficult to trace than Gothic letters such as the 9U. In the Gothic type, tracing can begin in the lower left corner of the "R" and proceed all around and back to the starting point without crossing or blending into another line (see Figure 13). In the Roman letter "R", the operator must remember to trace the serifs and watch for intersecting and blending lines which can take the tracing through the same section of the letter over and over again. With a little practice, the novice will get the knack of looking at the letter and planning a route which will take him through the letter with a minimum retracing (see Figure 14).

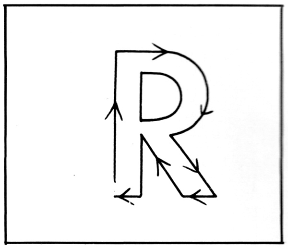


Figure 13

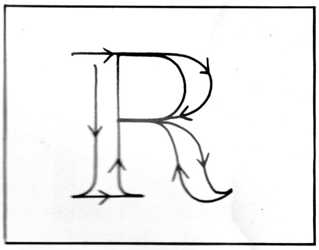


Figure 14

Develop the knack of shifting pressure on the tracing stylus from one side of the groove, to the other, to get from one line into the other, when tracing letters with blending lines. For example, with the 3U letter "O", a slight pressure should be kept on the outer wall of the groove when tracing the outer circle. Where the outer circle blends with the inner one, pressure should be shifted to the inner wall of the groove to complete the inner circle (see Figure 15).

Certain styles of type, such as the 99U, are designed to produce letters of greater-than-average widths. On such mats the letter "M" and "W" are so wide that the tracing stylus on the Varigraph can not reach the extreme right and left parts of these letters. It is, therefore, necessary to divide the letters into two parts. Each part of the "M" or "W" (see Figure 16) is to be treated as a separate whole letter. However, when tracing the second half, move the Varigraph only enough to allow this half to join the first.

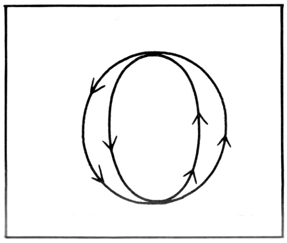


Figure 15

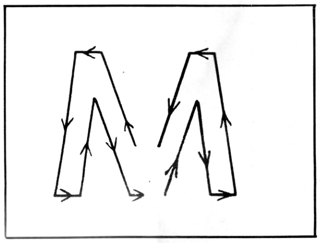


Figure 16

Many Varigraph operators develop little skills and ways which can speed up the work considerably. For example, on single-stroke alphabets, such as the 2U, letters like the "E" can be used to produce several letters. If the word "LIFE" is being lettered it is not necessary to shift the matrix for each of the letters. Instead, select the letter "E" and stay with it to produce all the letters in the word merely by tracing only those lines that apply to the letter being made. The letter "B" can be used also as a "P", etc.

Should it be necessary to go back to a previously drawn letter to add an omitted portion, the procedure described on pages 13 and 15, paragraph 11 may be used to align the Varigraph with the letter. The omitted part may then be added.

g - When lettering with broad-line pens, a slower tracing speed is necessary to permit an adequate flow of ink, otherwise the thick lines will have feathery edges. Slower tracing speeds are also recommended for working on acetate. If this does not produce a sufficiently black line on the acetate, it may be necessary to retrace the lines to build them up. Operation of Varigraph Fill-in mats is discussed on page 18.

15 - When a line of lettering has been completed the Varigraph may be in a position partly off the right-hand edge of the paper. To return the Varigraph to the left-hand side of the paper for the next line of lettering, raise the top edge of the Varigraph slightly and slide along the straightedge to the left. If the operator attempts to slide the Varigraph back onto the paper without so doing, the Varigraph feet may rip into the edge of the paper.

16 - If lettering is to be done near the bottom of the worksurface, there may not be enough room to support the Varigraph and the straightedge. In such case, the operator will find it necessary to raise the worksheet higher on the worksurface. In so doing, he must be certain that the new position of the worksheet is squared up so that the new lines of lettering will be parallel with the old.

17 - When lettering on thick material, use some scraps of the same material under the Varigraph and straightedge wherever they are not supported by the material being lettered. If this is not done, the Varigraph may reach a point where it will be half on and half off the thick material and an undesirable wobble may occur.

18 - When a Varigraph operator wishes to letter from right to left to center a line of lettering, or produce an even right hand margin, all procedures are the same as left-to-right lettering except that the tracing stylus is positioned in the groove in the right-hand side of the new letter and the Varigraph is moved to the left for spacing. With the pen off the paper, make a trial tracing of the right-hand side of the letter to see where the letter will begin in relation to the previous letter. The Varigraph will not smear the letters under it because it is elevated on metal feet which are positioned so that they clear the work being done.

19 - As stated above, lines of lettering may be centered by working from right to left beginning from the center of the line and doing the first half of the copy. The remaining half may be done by starting at the center and working from left to right in the usual manner. At best, this method may be used only where precise centering is not required. Good designing of type faces requires that many characters vary in width, therefore, whenever the characters in a line are counted for centering purposes, it will be necessary to count "I's" as half letters and "M's" and "W's" as one-and-a-half letters. In certain styles of type other allowances may be necessary. Where paste-up work is used, the simplest and most accurate method for centering lines of copy is to perform each line of lettering to the desired width and rule a faint vertical pencil line in the center of each line. Then trim each line of lettering as closely as possible, with scissors or razor blade. Rule a faint vertical pencil line on the paste-up board or paper to indicate where the center of each line of finished lettering is to fall. Then paste each line of lettering into position by matching the pencil lines on the finished lettering and on the paste-up board or paper.

Where accurate centering must be performed without pasting up, such centering can be done also by making trial runs as described on page 6.

20 - As mentioned previously, the Varigraph can be used by left-handed people. It should be positioned so that the tracing stylus is at the lower left side. See Figure 9. The left hand will operate the tracing stylus and the right hand will operate the pen-lift lever. The matrix should be inserted through the right-hand side of the Varigraph. Although the Varigraph will appear to slide over the lettering as the work progresses, there is no danger of smearing the work since the supporting feet keep it elevated from the worksheet.

The left-handed operator will notice that often the letters on the matrix cannot be positioned in front of the pointer on the base of the Varigraph and be in a locked position, too. Since it is more important for the matrix to be in a locked position, it is best to ignore the pointer on the base of the Varigraph just so long as the desired letter is within the field of the tracing stylus.

21 - In any type-composition system, either mechanical or hand, a certain number of errors or accidents must be expected. The Varigraph operator is fortunate in that he has a number of means whereby corrections may be made. When work is being done for photographic reproduction, the easiest way to make major alterations is to do the damaged work over again and paste the correction into position. Minor errors may be corrected by scraping away the error with a sharp razor blade. The paper should be of top quality to withstand such treatment without shredding and causing further damage. Corrections on acetate may be accomplished by wiping off the old work with a dampened cotton swab. The most preferred method for making corrections on paper is with good white tempera paint and a fine-pointed sable brush. A steady hand can be developed by most people with a little practice. A few pointers for developing this skill are:

a - Have a good strong light set at an angle which will throw the hand shadow back toward the operator.

b - Hold the brush lightly about 3/8 inch from the metal tip (see Figure 17).

c - Rest the hand on a piece of scrap paper to prevent smearing the work underneath, and to prevent invisible, oily hand-and-finger prints from causing the ink not to adhere. If possible, rest entire length of arm and elbows on the worksurface (see Figure 18).

d - Do not attempt to use a brush overloaded with paint or one with too little paint. A little practice will enable the operator to handle the brush with enough paint to flow freely without dripping unexpectedly.

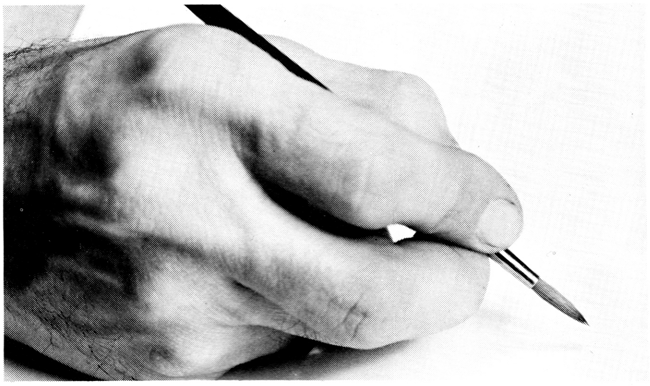


Figure 17

e - Do not attempt to put the paint right on the spot to be corrected. Instead, take two or three dry passes in the direction parallel to the way the correction is to be made, then start painting just short of that point. Paint steadily up to the desired spot.

f - Some people find that holding their breath at the start of painting increases steadiness of hand.

22 - Often the Varigraph beginner-operator who is without any experience in typography, hand lettering, etc., raises the questions of what constitutes good letter spacing and how he can achieve it. There are many answers to these questions and many books are available that deal with them. In this booklet only the basic principles involved can be discussed. Good letter spacing is the arrangement of letters in a line of type so that they will appear to have uniform distances between them. To achieve this appearance, it is often necessary to actually set the letters at varying distances from one another, depending on the combination of letters involved. The correct distances can best be determined if the operator will envisage the areas between letters as being irregular containers for water. The object, then is to space the letters so that no matter how irregular the shape of these containers, they will all hold the same amount of water. With this in mind, let us consider the word "LAP". If we were to space all the letters at uniform distances as in Figure 19, you will note that although the letters are equally spaced, the container between the "L" and "A" appears as though it will hold more water than the container between "A" and "P". Therefore, the container between "A" and "P" should have been made larger as shown in Figure 20.

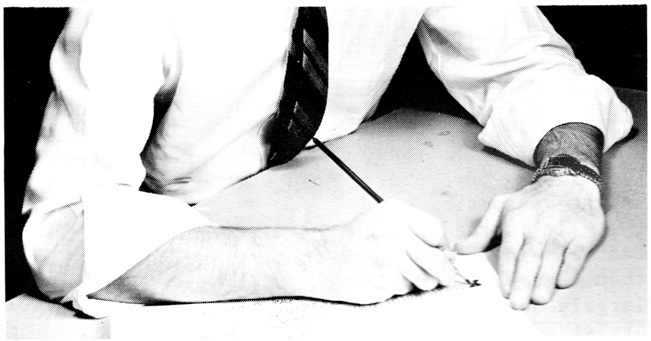


Figure 18

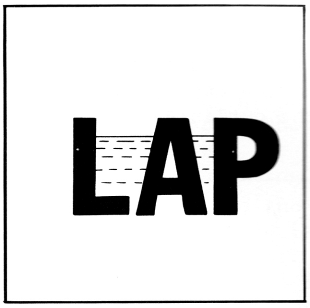


Figure 19

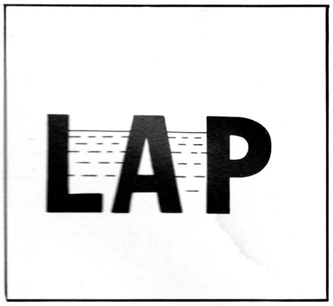


Figure 20

As it is impractical to spend much time comparing sizes of containers between each pair of letters, most operators prefer to develop a sense of spacing keeping the previously discussed principles in mind.

It is admitted that rarely can one find flawless examples of work no matter what composing methods for typography are used. If the inexperienced user is interested in improving his eye for letter spacing, we suggest that he take notice of any and all display type material that henceforth comes his way. We are certain that this greater awareness will improve his work considerably.

PART 6 COMPLETION: FILL-IN AND PASTE-UP

Style C92U

FILL-IN MATS. The latest advancement in the field of mechanical lettering devices is the development of Varigraph Fill-in Mats. These mats are designed to facilitate filling-in the outlines letters. Operators who have no experience in the use of artist brushes and pens will find that the Fill-in Matrix offers a quick, safe means for accomplishing this work.

The Fill-in Matrix is similar to any standard matrix with the exception that the areas of the letter which are usually filled-in, have been routed-out to a depth half way between the surface of the matrix and the bottom of the outlining groove. (See Figure 21.)

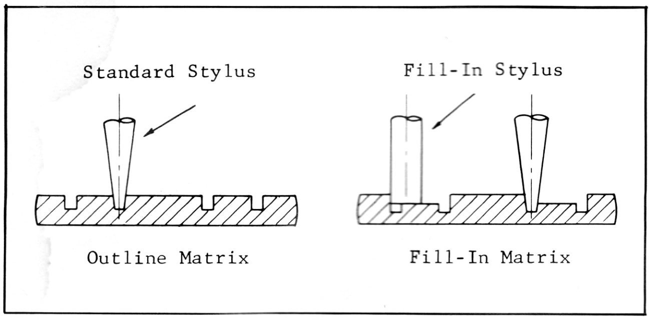


Figure 21

There are several ways in which the Fill-in Matrix can be used. In each of the methods the use of the broad tipped fill-in tracing stylus is required. Before the fill-in tracing stylus can be used the first time, it is necessary to remove the snap-ring which retains the standard tracing stylus with which the Varigraph comes equipped. See Figure 22. To remove the snap-ring, press the tracing stylus down with the index finger of the left hand and push the snap-ring sideways with both thumb nails. The removed snap-ring may be discarded. The standard tracing stylus can be removed now and the fill-in tracing stylus inserted.

To perform the smaller sizes of lettering, use the Fill-in Matrix exactly as any other matrix up to the point of completing the outlined letter. Next, without moving the Varigraph instrument, remove the standard tracing stylus and insert the fill-in stylus. The filling-in is done by tracing the routed-out sections of the matrix while the pen blacks-in the outline. Since the fill-in stylus is broader than the standard stylus, there is no danger that the pen will accidentally over-run the outline of the letter. To perform larger sizes of lettering, the following procedure is used: Perform the entire line of lettering in outline with one of the finer-line pens. Then change to a heavier-line pen (See Required Fill-in Pen Sizes next column) and insert the fill-in stylus. Place the first letter of the line of lettering in tracing position in the Varigraph to the first letter. Fill-in the first letter and move the Varigraph to fill-in the same letter wherever it occurs in the whole line of lettering. Then do the second letter wherever it appears in the line, then the third, etc., etc. Re-orienting the Varigraph over each letter is not difficult after a little practice. Simply position the fill-in stylus in any corner of the desired letter and slide the Varigraph along the straightedge until the low hovering pen is lined up over the same corner of the outlined letter on the worksheet. The pen is properly lined up when the edge of its tip is barely touching the letter outline and the remainder of the pen's tip is within the area that is to be blacked in. (See Figure 23.)

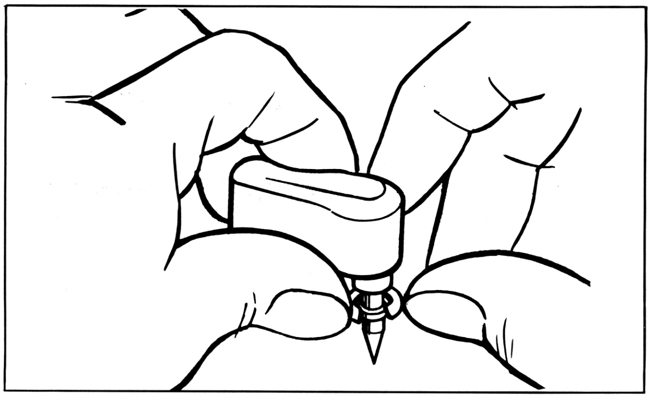


Figure 22

The correct combination of outlining -- and filling-in pens will vary from size to size and from type style to type style. Before work commences, it is suggested that one or two trial letters be performed with the likeliest combination. If the results are not satisfactory, the combination will have to be altered. See chart for suggested combinations:

REQUIRED FILL-IN PEN SIZES

Sizes of Lettering	Use Pen
.150 - .250	No. 00
.275 - .375	No. 2
.400 - .550	No. 3
.575 - .650	No. 4
.675 - .750	No. 5

It has been found that maximum success with Fill-in Mats is assured where the type sizes are not overly expanded or condensed. Extreme distortioning will create problems in the selection of good combinations of pens.

HAND FILL-IN. Many Varigraph operators have found that the knack of filling-in by hand with a pen, or preferably a brush, can be acquired with practice. They may prefer hand methods for the following reasons:

1 - It is the opinion of many artists that they can fill-in as fast, or faster, perhaps, by hand, than they can with Fill-in Mats. This, of course, largely depends upon the skill of the individual artist and consequently, may not be true of the average Varigraph user. For this reason, if doubt exists as to what type of mats to purchase, at least one of each should be ordered. After using them for a month or two, a decision can be made and the unwanted mats may be returned for credit, exchange, or refund.

2 - Not all styles of type can be made up as Fill-in Mats. Hence the operator's choice of styles may be extremely limited if he is unable to use non-fill-in mats.

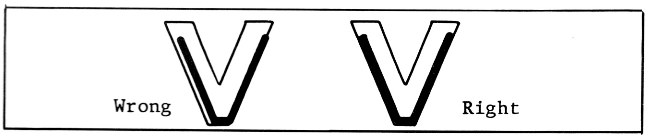


Figure 23

3 - As mentioned previously, Fill-in Mats will not work as efficiently when used for extremely condensed or extended lettering; if such extremes are required, some hand-filling may be necessary.

4 - Fill-in Mats are considerably more difficult to produce, which accounts for their higher cost. If the filling-in can be done efficiently by hand, appreciable savings can be made in the purchasing of mats.

The technique of handling a pen or brush for filling-in is the same as described for retouching errors. Refer to discussion on page 16. Speed will come with practice. Most artists prefer the brush because it can apply more ink over a larger area in less time. A good quality, pointed brush should be used. At first it is advisable to turn the work as it progresses so that the easiest type of downward stroke can be used for all sides of the outlined lettering. Turn the work so that painting may begin to the right of the outline, then paint steadily up to the outline as shown in Figure 24. With enough practice it will be found that accurate painting can be done in other directions as well as downward, thus eliminating much paper turning. If the brush is carrying the right amount of ink, it will flow off evenly and spread right up to the dried-ink outline on the worksheet. This dried-ink outline acts as a barrier to further spread of the ink, if the brush is not over-loaded. Under-loading the brush may seem safer to the beginner, but it takes many more strokes to fill-in the letter, which is more time consuming. Some Varigraph operators find it easier to fill-in with various types of India ink pens. The Rapidograph pens (see Varigraph Type Catalog) which are available in four sizes are ideal for this technique. They hold a considerable supply of ink and do not require constant dipping. The handling of pens is the same as for brushes. Do not press hard on the pen; the lighter the pressure, the less danger there is of disturbing the paper's surface.

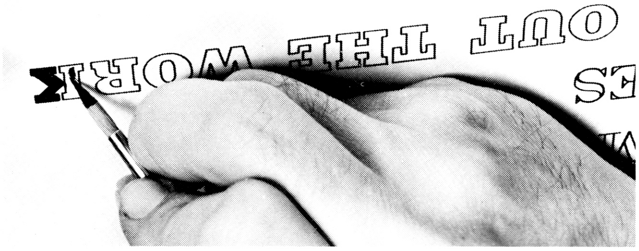


Figure 24

In certain cases the Varigraph can be used to fill-in the outlined letter as made from standard non-Fill-in-type mats. The style of type, thickness of pen, and the size of the reproduced lettering must be considered before this technique is used. The technique is simple; after each outlined letter is performed, the Varigraph's outline tracing stylus is placed on the part of the matrix letter corresponding to the part of the outlined letter which is to be filled-in. The tracing stylus is then operated back and forth or up and down while the pen is in the writing position, thus filling-in the letter. If the stylus is moved too far in any direction, it will fall into the matrix groove and prevent the pen from inking over the outline. If care is not exercised to keep the tracing point in contact with the surface of the matrix, the tracing point may over-shoot the engraving and the pen will ink over the outlined letter. In most cases, this technique will work best on the smaller sizes of lettering where the hazard of over-inking the outline is less than on larger sizes of lettering.

No matter what method is used to fill-in the outline lettering, a good light source, set at an angle that will throw hand shadows back towards the operator, and adjusted so that the operator's eyes are shielded from the direct glare of the bulbs, is an essential item.

Most Varigraph beginners conclude by now that some experimenting is necessary before the most satisfactory technique for filling-in outlined lettering is acquired. Naturally, in the course of any experimentation, mistakes and errors occur, but all who apply themselves to even a small degree will find the results worthwhile.

PART 7 PASTING-UP FINISHED LETTERING

Style 975U

The last step which many Varigraph operators perform is the pasting-up of the finished lettering. (Other Varigraph operators may have found it more practical to perform all the lettering in position directly on the finished art work; others may work in departments which have other personnel to relieve the Varigraph operators of this work.) For those who will be doing their own paste-up work, it is recommended that they refer to page 5 for the materials required for this operation.

It is usually desirable to perform the pasting-up on heavy board or paper. A good grade of illustration board can withstand practically all types of handling and, especially for large size work, is highly recommended. Small work may be done on thinner material. The size of the paste-up board should be at least two or three inches larger than the actual size or boundries of the layout. This will leave enough room for handling the board and for taping it to the work surface. When the paste-up has been completed, the excess edges may be trimmed down if desired. The first step is to square the paste-up board on the worksurface and fasten it securely. Next, with pencil, lightly indicate the borders of the layout on the paste-up board. Perform both of these steps as accurately as possible. Use a pencil of medium hardness and keep its point sharpened throughout all of the operations.

The next step is to indicate with pencil the exact positions where all the art and lettering units will be pasted-up. The original layout may be used as a guide for plotting these positions, providing that it was accurately made. If it was not so made, it is suggested that all the art and lettering units be trimmed out closely with a razor blade or scissors, then laid out on the paste-up board in the most desirable positions. These positions may now be marked off on the paste-up board with pencil. Check all horizontal alignments with T-square or parallel straightedge. Check all vertical alignments using a right-triangle as shown in Figure 25. The units may now be pasted in position with rubber cement. Rubber cement may be purchased in cans, or jars which have applicator brushes attached to the caps. If the rubber cement is too thick and cannot be applied evenly, the addition of rubber-cement thinner will correct it.

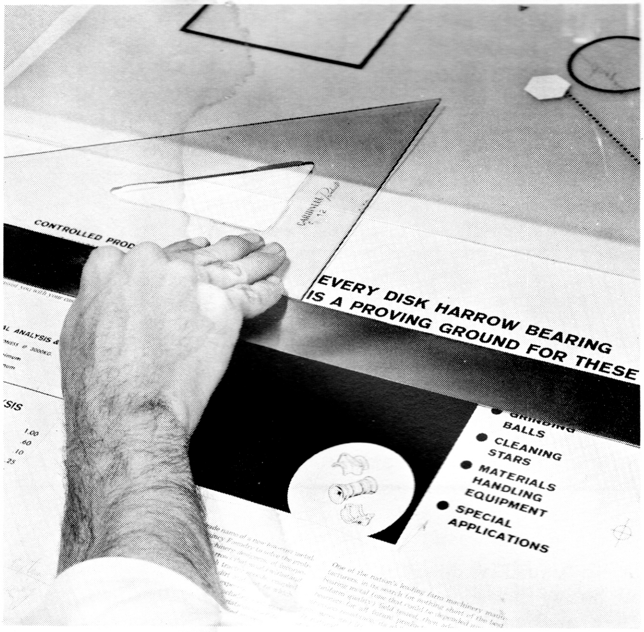

CONTROLLED PROD
EVERY DISK HARROW BEARING IS A PROVING GROUND FOR THESE
BALLS
CLEANING STARS
MATERIALS HANDLING EQUIPMENT
SPECIAL APPLICATIONS

Figure 25

The rubber cement should be applied evenly over the entire back of the parts to be pasted-up as well as to the worksheet. The parts should be placed in position immediately thereafter. As each part is positioned, it should be checked with the T-square and triangle for proper alignment. While the rubber cement is wet the part will slide easily and may be adjusted for proper alignment. Small or difficult-to-handle parts should be picked up with chisel-tipped tweezers and maneuvered into position. Excess rubber cement on the lettering, art work or paste-up board may be removed with special rubber-cement pick-up erasers, or rubbed off with clean finger tips. Be sure all visible excess rubber cement is removed, otherwise it will be photographed and may require expensive retouching later.

If a pasted-up part has to be taken up for repositioning, or any other reason, it may be removed by slipping a razor blade under a corner of the part and grabbing the raised corner with fingers or tweezers. If the rubber cement has not hardened too much, the rest of the part should come off easily with a little careful pulling. If the rubber cement is too hard, the part will have to be saturated with rubber-cement thinner to soften it. Fill a clean oil can with rubber-cement thinner and squirt it liberally under the lifted corner. As the part is being stripped off, continue saturating the cement underneath. The thinner will dry rapidly and leave no marks. When the part has been lifted, clean all the old rubber cement from it and the paste-up board before pasting-up the part again.

Where uniform distances between lines of lettering are required, a pair of dividers may be set at the desired distance between the bottom of one line of lettering and the bottom of the next line. The dividers may now be used to mark off the distances on the paste-up board. Draw a vertical pencil line on the paste-up board and then mark off the line distances by "walking" the dividers down this line. The marks left by the dividers will show where the base of each line of lettering is to be pasted.

When paste-ups are being prepared for color reproduction, it is usually advisable to have an accurate layout or key-rendering or tracing paper or, preferably, acetate. Since a separate paste-up will be required for each color, the key-rendering will be necessary to check the positions of all the layout on each paste-up. Cross - or register-marks should be drawn just outside the borders of the layout on each of the paste-ups and on the key-rendering. These marks must be drawn accurately in position so that when the key-rendering is superimposed on each paste-up and its register-marks aligned, all elements may be properly checked for position. Register-marks will also assist the printer in checking his work. Of course, these marks will be trimmed away after the printing is completed.

VARIGRAPH OPERATING MANUAL

INDEX

Page

Correcting Minor Errors............16, 20
Curve Attachment.......................10
Custom Engraving........................9
Drawing Boards.......................2, 3
Inks.................................4, 5
Ink Does Not Flow.................4, 5, 9
Ink Flow Too Heavy...................9, 15
Ink Line Too Light.....................16
Ink Line Too Wide...............9, 12, 13
Ink Lines Broken.....................4, 5
Inserting a Pen........................13
Inserting a Mat........................13
Left Handed Use........................12
Lettering in a Curve...................10
Lighting............................2, 19
Matrices.............................8, 9
Matrices, Fill-In..............17, 18, 19
Matrix Case.............................3
Mats Slide Hard.........................9
Paper, To Fasten Down..................11
Papers..................................4
  Bristol Board.........................4
  Craftint..............................4
  Illustration Board....................4
  Tracing Paper.........................4
Pens, Fill-In Sizes....................18

Page

Pens, Maintenance.......................9
Pens, Production.......................10
Pens, Rapidograph......................19
Pen Size, Selection of.................12
Pen Tank...............................10
Plastic Sheets..........................4
  Frosted Vinyl.........................4
  Clear Acetate.........................4
  Benday Acetate Sheets.................4
Servicing a Varigraph................7, 8
Spacing Between Letters.........13, 15, 17
Split Letters.......................12, 15
Straightedge............................3
To Center a Line of Lettering..........16
To Determine Letter Sizes...........11, 12
To Flatten Wavy Paper..................13
To Get Registration for Filling In.....18
To Letter on a Certain Line............13
To Make Corrections....................16
To Remove Standard Tracing Point.......18
Tracing a Letter....................13, 15
T-Square (Boardlock T-Square)...........3
Using a Brush.......................16, 17
Using a Fine Point Pen.................10
Work Surface.........................2, 3